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THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner : Zandra V. Smith  
Group Art Unit: 2877  
Applicants : James L. Overbeck et al  
Serial No. : 09/733,162  
Filing Date : December 8, 2000  
For : OPTICAL MEASUREMENT DEVICE AND RELATED PROCESS

BOX PETITION

Commissioner for Patents  
Washington, D.C. 20231

PETITION TO MAKE SPECIAL UNDER M.P.E.P. §708.02 VIII

Applicants hereby petition to make the above-identified application special under M.P.E.P. §708.02 VIII. This application has not been examined by the Patent Office.

1. A Preliminary Amendment accompanies this Petition.
2. All claims as amended and added in the accompanying Preliminary Amendment are directed to a single invention.
3. A pre-examination search was made by the European Patent Office in the following classifications: IPC 7; A61B; A61C; G01J; and G01T. A copy of the International Search Report received from the European Patent Office in the corresponding PCT application is attached as Exhibit A. The Fifth Supplemental Information Disclosure Statement previously filed in this U.S. application discloses the references cited in the International Search Report.
4. Copies of the two (2) references, that are of any conceivable relevance to the subject matter encompassed by the pending claims, U.S. Patents 6,132,210 to Lehmann and 5,177,694 to Graham, are attached as Exhibits B and C.
5. A Discussion that points out how the claimed subject matter in the pending claims is patentable over these two (2) references is set forth below.

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Applicants : James L. Overbeck et al  
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Page No. : 2

## DISCUSSION

### A. U.S. Patent 6,132,210 to Lehmann

Lehmann discloses an isolation sleeve used to color calibrate a camera. With reference to Figs. 11 and 12, the isolation sleeve 25 includes an opening 33, through which an object is captured in an image, and a color calibration area 35 of a certain calibration color. Col. 12, Lns. 60-67. The color calibration area 35 is sampled by the camera, and the values for the calibration color are used to adjust the color of the object captured in the image by the camera. Col. 13, Lns. 29-36.

Regarding amended independent claims 66, 74, 80 and 86, Applicants respectfully submit that Lehmann fails to disclose, teach or suggest an illumination intensity reference area on the shield that is used to monitor the output intensity of an illuminator. Lehmann calibrates color, but fails to recognize--let alone to compensate for--illumination variation.

Accordingly, Applicants respectfully submit that the amended claims are patentable over Lehmann.

### B. U.S. Patent 5,177,694 to Graham

Graham discloses a light housing shield 10 (Fig. 9) on a video camera 11 (Fig. 4). A color reference strip 12 (Figs. 7-8), held-up near the teeth, is imaged by the camera with the teeth 16. Col. 4, Lns. 51-56. The strip is used as a *color* reference, and the color of the tooth in the image is adjusted based on the known color of the strip. Col. 2, Lns. 3-24.

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Regarding amended independent claims 66, 74, 80 and 86, Applicants respectfully submit that Graham fails to disclose, teach or suggest a shield including an illumination intensity reference area in the field of view. Like Lehmann, Graham fails to recognize any need to address variations in illumination--let alone suggest a solution.

Accordingly, Applicants respectfully submit that the amended claims are patentable over Graham.

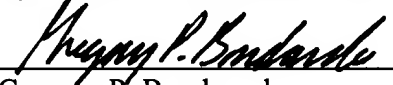
6. The fee required under 37 C.F.R. §1.17(i) of \$130 is enclosed.

The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 23-0457. Two copies of this sheet are enclosed.

Respectfully submitted,

JAMES L. OVERBECK ET AL

By: Warner Norcross & Judd LLP

  
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## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No.	International filing date (day/month/year)	(Earliest) Priority Date (day/month/year)
PCT/US 00/ 33478	08/12/2000	08/12/1999
Applicant		
X-RITE INCORPORATED		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 8 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☒ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

6

☐ None of the figures.

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 00/33478

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-8,9-13,14-16,17-19 and 20-22

Optical measurement of a tooth using constant irradiance.

2. Claims: 23-35,36-42,43-44,45-52 and 53-65

Colorimetric imaging using time-separated frames of different bandwidths of light reflected from the tooth.

3. Claims: 66-73,74-79,80-85 and 86-87

Sanitary shield with a reference colour

4. Claims: 88-94,95-99,100-105 and 106

Display to present the image to the operator in the same line-of-sight as the image sensor.

5. Claims: 107,108-111 and 112-116

Instrument housing with sealed measurement window.

6. Claims: 117-121,122-127,128-130 and 131-132

Comparing images of a tooth and a dental prosthesis for colour matching.

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/33478

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61B5/00 A61C19/10 G01J3/51

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61B A61C G01J G01T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X  A	EP 0 367 647 A (BERTIN & CIE) 9 May 1990 (1990-05-09) column 3, line 7 -column 6, line 11 figure  ---  -/--	1,9,14, 17  3,5,7, 10,11, 13,18-22



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

### \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

14 September 2001

Date of mailing of the international search report

Name and mailing address of the ISA

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NL - 2280 HV Rijswijk  
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Authorized officer

Chen, A

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/33478

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 428 450 A (VIEILLEFOSSE ET AL.) 27 June 1995 (1995-06-27) column 4, line 26 -column 6, line 55 figures 1,2	1,9,14, 17
Y		88,95, 100,107, 108,112
A		2,5, 8-13,17, 19,22, 30,33, 52, 90-92, 101,104, 106
X	WO 97 41767 A (GREEN) 13 November 1997 (1997-11-13) page 11, line 2 - line 14 page 12, line 22 -page 13, line 23 page 15, line 19 - line 29 figures 1,7	106
Y		88,95, 100
A		27,33, 34,40, 49,56, 57,97, 101
Y	US 5 599 278 A (HIBBARD ) 4 February 1997 (1997-02-04) column 3, line 14 -column 4, line 23 column 6, line 18 - line 42 figure 1	107,108, 112
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X	EP 0 928 957 A (MHT OPTIC RESEARCH AG) 14 July 1999 (1999-07-14) column 2, line 34 -column 5, line 31 column 7, line 20 -column 9, line 23 figures	1,9,17, 20
Y		23,36, 43,45
A		3,4,7, 13,14, 20,21, 33,44, 53,90-92
P,X	& US 6 038 024 A 14 March 2000 (2000-03-14) cited in the application	



# INTERNATIONAL SEARCH REPORT

In. International Application No

PCT/US 00/33478

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 964 692 A (PRESCOTT) 23 October 1990 (1990-10-23) column 1, line 17 - line 25 column 6, line 42 -column 7, line 2 figures 6,7	2
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Y		23,36
A		24-26, 43, 45-48, 54,58-62
X	US 5 241 170 A (FIELD, JR. ET AL.) 31 August 1993 (1993-08-31) column 6, line 39 -column 8, line 20 figures 3-5	53
Y		43,45
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A		67-70, 72,73, 75-79, 81-85, 87,88, 93-95, 99,100, 102-106
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International Application No

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 195 34 517 A (FISCHER) 6 March 1997 (1997-03-06) column 3, line 18 -column 6, line 38 figures 1,7-11	66,80
A		1,4,6,9, 11,12, 14,17, 19,20, 22,68, 74,75, 77,84, 86,93, 94, 98-103
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A		95-97, 100,101, 109,110, 113,114
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A		118-121, 123-127, 129,130, 132
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 01745 A (LJ LABORATORIES, L.L.C.) 20 July 1999 (1999-07-20) column 9, line 15 -column 13, line 5 column 28, line 6 -column 30, line 4 column 49, line 31 -column 51, line 8 figures 1,7A-8C,27,28	117,122, 128
A	---	1,3,6,9, 17,20, 118,121, 131
X	US 5 961 324 A (LEHMANN) 5 October 1999 (1999-10-05) column 5, line 10 -column 8, line 29 figure	117
A	-----	118, 121-123, 128,131

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International Application No

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# United States Patent [19]

## Lehmann

[11] Patent Number: 6,132,210  
[45] Date of Patent: \*Oct. 17, 2000

### [54] TOOTH SHADE ANALYZER SYSTEM AND METHODS

[75] Inventor: Maryann Lehmann, Darien, Conn.

[73] Assignee: Shade Analyzing Technologies, Inc., Darien, Conn.

[\*] Notice: This patent is subject to a terminal disclaimer.

[21] Appl. No.: 09/385,615

[22] Filed: Aug. 30, 1999

### Related U.S. Application Data

[63] Continuation of application No. 09/082,030, May 20, 1998, Pat. No. 5,961,324, which is a continuation-in-part of application No. 08/494,979, Jun. 26, 1995, Pat. No. 5,766,006.

[51] Int. Cl.<sup>7</sup> ..... A61C 19/10

[52] U.S. Cl. .... 433/26; 356/408

[58] Field of Search ..... 433/26, 29, 203.1, 433/215; 364/413.28; 356/402, 405, 406, 408

### [56] References Cited

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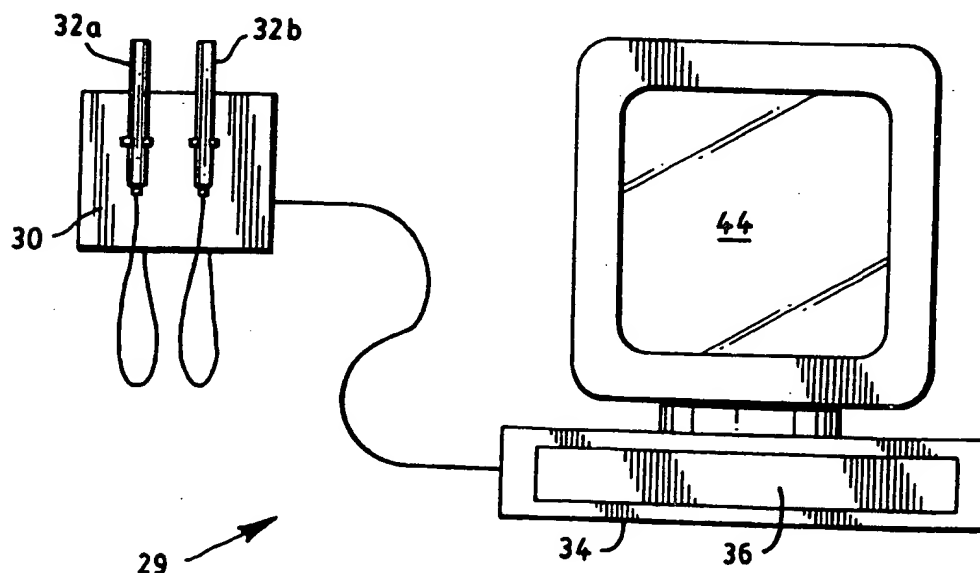
WO05/15731 6/1995 WIPO.

Primary Examiner—Pedro Philogene  
Attorney, Agent, or Firm—Pennie & Edmonds LLP

### [57] ABSTRACT

A tooth shade analyzing system and method of use. The system includes a digital camera which connects to a shade analyzer subsystem, e.g., a digital video processor, and a color display monitor. The camera captures a digital color image of the patient's tooth and the subsystem compares that image to a stored plurality of tooth shades. Each tooth shade is represented in a block of data, including color image data, a tooth shade digital word, and a manufacturer type. The patient's tooth image includes an RGB chromaticity representation that is scanned and compared with the several tooth shades stored in memory, and a match is determined and communicated to a user of the system. The method of use includes the specification of fractional tooth shades, if needed, corresponding to a plurality of porcelain films for manufacturing a reconstructed tooth.

26 Claims, 10 Drawing Sheets





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